Advancing Education and Integration of Green & Sustainable Chemistry & Engineering

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Outline

- What is GC3?
- The GC3 Education Policy Statement
- Growing green chemistry & engineering (GCE) within a company
- Encouraging GCE in academia

GC3 – Green Chemistry & Commerce Council

- Business-to-business forum
  - ~75 members
  - ~75% corporations & businesses
  - ~25% government & NGO
- Goal: advance the application of green chemistry and design for environment across supply chains
- http://www.greenchemistryandcommerce.org/index.php

GC3 – how it works

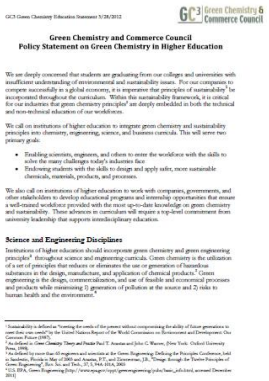
GC3 Green Chemistry & Commerce Council
Moving Business Toward Safer Alternatives

- Webinars & forums
- Short list of annually-focused projects
  - Highly collaborative!
- 2012-2013 projects:
  - **Business and Academic Partnerships for Safer Chemicals**
  - **Engaging Retailers in the Adoption of Safer Products**
  - **Facilitating Chemical Data Flow Along Supply Chains**
  - **Advancing Green Chemistry Education**
    - How can we embed green chemistry in university and professional education?

DOW

Education project goals

•Develop a “policy statement” in support of green chemistry education at the university level



GC3 Green Chemistry Education Statement 3/28/2012

GC3 Green Chemistry & Commerce Council

Green Chemistry and Commerce Council
Policy Statement on Green Chemistry in Higher Education

We are deeply concerned that students are graduating from our colleges and universities with insufficient understanding of environmental and sustainability issues. For our companies to compete successfully in a global economy, it is imperative that principles of sustainability[1] be incorporated throughout the curriculum. Within this sustainability framework, it is critical for our industries that green chemistry principles[2] are deeply embedded in both the technical and non-technical education of our workforces.

We call on institutions of higher education to integrate green chemistry and sustainability principles into chemistry, engineering, science, and business curricula. This will serve two primary goals:

- Enabling scientists, engineers, and others to enter the workforce with the skills to solve the many challenges today's industries face
- Endowing students with the skills to design and apply safer, more sustainable chemicals, materials, products, and processes.

We also call on institutions of higher education to work with companies, governments, and other stakeholders to develop educational programs and internship opportunities that ensure a well-trained workforce provided with the most up-to-date knowledge on green chemistry and sustainability. These advances in curriculum will require a top-level commitment from university leadership that supports interdisciplinary education.

Science and Engineering Disciplines

Institutions of higher education should incorporate green chemistry and green engineering principles[3] throughout science and engineering curricula. Green chemistry is the utilization of a set of principles that reduces or eliminates the use or generation of hazardous substances in the design, manufacture, and application of chemical products.[4] Green engineering is the design, commercialization, and use of feasible and economical processes and products while minimizing 1) generation of pollution at the source and 2) risks to human health and the environment.[5]

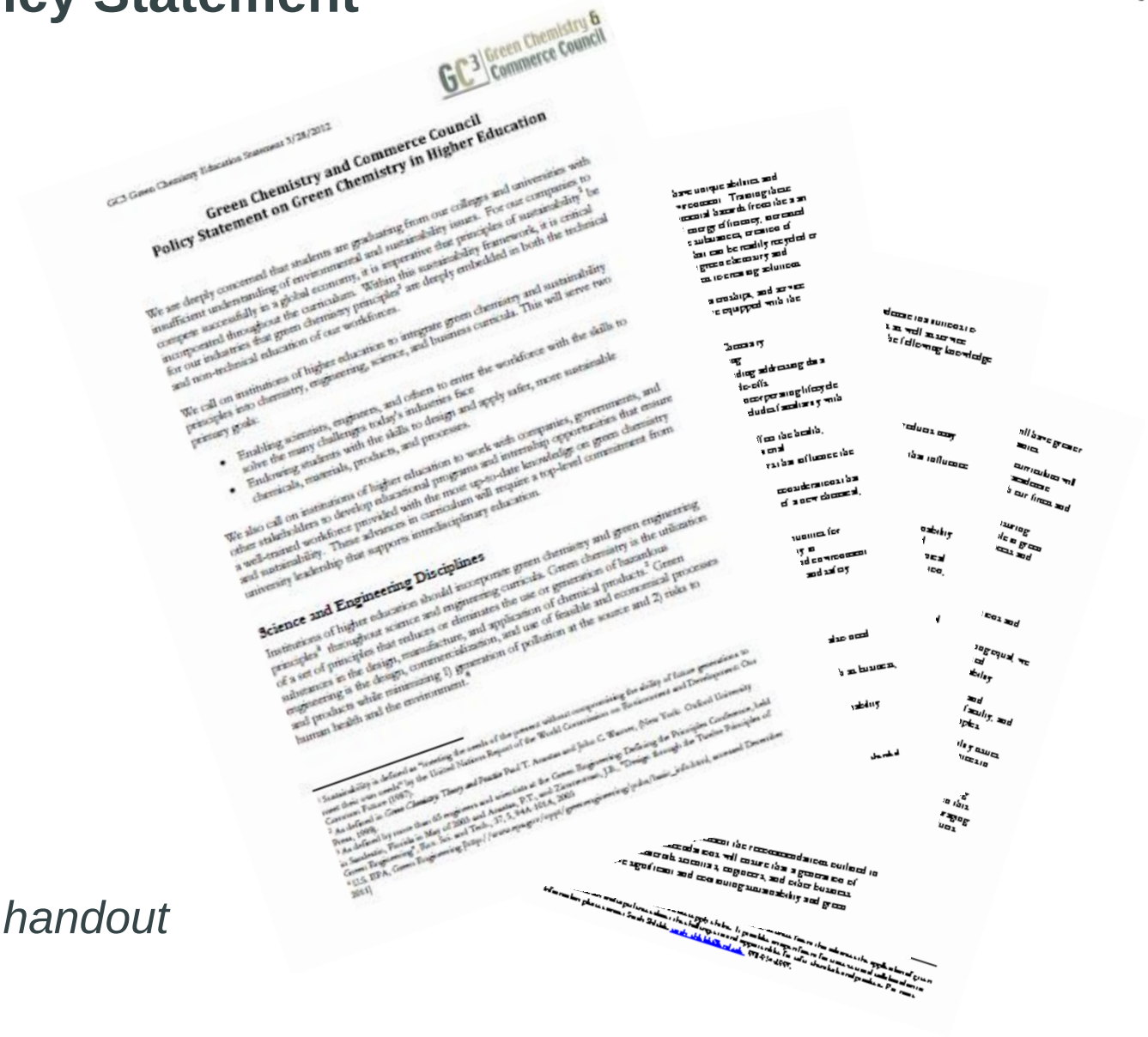
[1] Sustainability is defined as "meeting the needs of the present without compromising the ability of future generations to meet their own needs" by the United Nations Report of the World Commission on Environment and Development: Our Common Future (1987).

[2] As defined in *Green Chemistry: Theory and Practice* Paul T. Anastas and John C. Warner, (New York: Oxford University Press, 1998).

[3] As defined by more than 65 engineers and scientists at the Green Engineering: Defining the Principles Conference, held in Sandestin, Florida in May of 2003 and Anastas, P.T., and Zimmerman, J.B., "Design through the Twelve Principles of Green Engineering" Env. Sci. and Tech., 37, 5, 94A-101A, 2003

[4] U.S. EPA, Green Engineering [http://www.epa.gov/oppt/greenengineering/pubs/basic_info.html, accessed December 2011]

Policy Statement



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[illegible]

[illegible]

[illegible]

see handout

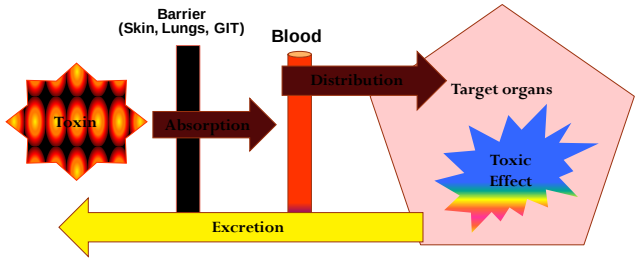
Policy Statement Elements

•What elements define adequate GCE college, university & professional education?

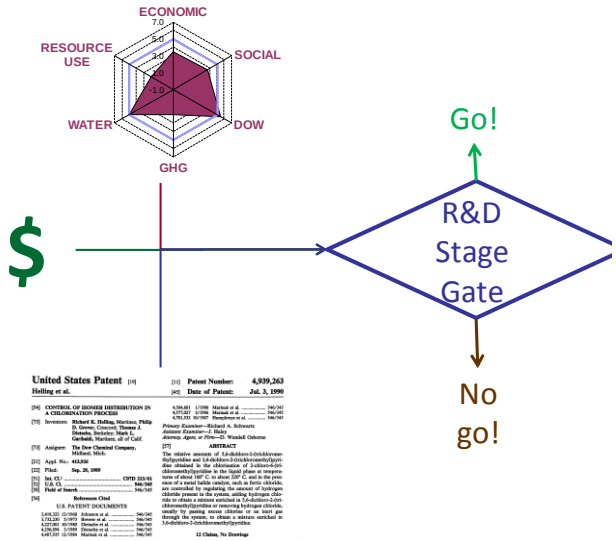
- Science & Engineering majors
- Business & other majors
- Breadth of topics very similar; depth depends on major

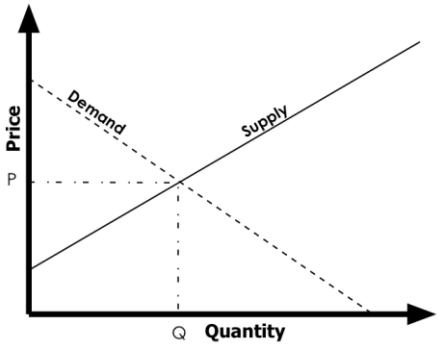
•What will companies do with/for higher learning institutions & graduates?

Education Elements



"Tox 101"





Corporate Commitments
(all else being equal)

•Providing resources and support to work with academic institutions and suppliers in advancing recommendations

• Preferential hiring of people with demonstrated knowledge and ability of the recommendation

• Value and support research and innovation in universities where skills and knowledge are being adopted

• Value and support continuing education on these subjects for a range of staff

• Encourage supply chain companies to adopt similar practices and share commitment

Signers

- Actio Software Corporation
- Anvil Knitwear
- Construction Specialties, Inc.
- Dell, Inc.
- DesignTex
- The Dow Chemical Company
- ecoSolv Technologies, Inc
- Green Depot
- Herman Miller
- Hewlett Packard
- Johnson & Johnson
- Method Products, Inc.
- NatureWorks, LLC
- Nike, Inc.
- Segetis, Inc.
- Seventh Generation
- Steelcase
- The Wercs Ltd.
- Valspar Corporation

Will you join this list?

- Center for Environmental Health
- Environmental and Public Health Consulting
- EPEAT, Inc.
- GreenBlue Institute
- Minnesota Pollution Control Agency
- Pacific Northwest Pollution Prevention Resource Center
- Pure Strategies, Inc.
- Sustainable Research Group
- ToxServices, LLC
- University of Toledo
- WA State Department of Ecology

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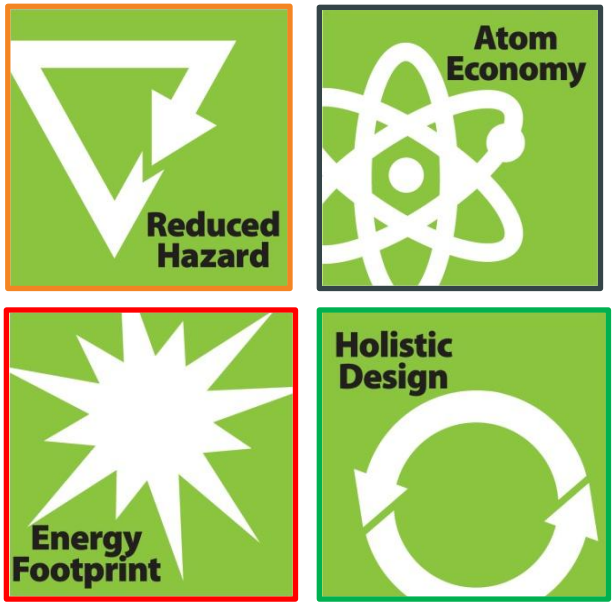
Growing green chemistry & engineering (GCE) within Dow

•Principles of Sustainable Chemistry & Engineering program



•A “Bottom Up” employee network

Encouraging GCE in academia

GC3 Green Chemistry & Commerce Council
Moving Business Toward Safer Alternatives

Berkeley
University of California

- Grant to College of Chemistry to renovate labs, curriculum and instramentation to incorporate sustainable chemistry concepts
- Dow Chair in Sustainable Chemistry
- Collaboration with Haas Business School

MICHIGAN

- Sustainability Fellows Program
  - 6 years
  - ~300 graduate students
  - Highly inter-departmental
  - Dow “loaned executive”

SISCA
Dow Sustainability Innovation Student Challenge Award

- Sustainable Innovation Student Challenge
  - 17 global leading universities
    - http://www.dow.com/sustainability/studentchallenge/

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Summary

- Growing Green & Sustainable Chemistry & Education can be done:
  - Within a company
  - By industry/academic collaboration
  - Through support of the GC3 Education Policy Statement

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Science and Engineering Disciplines